APPENDIX A

Sample Benchsheets

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Facility Name: _____

BOD_5 Benchsheet

Sample Location (specific) _____ **Sample Type** (grab, xx hr Comp., etc.)

Raw _____ _____
Final _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____

Sample Date: _____ Test Date: _____
Collected by: _____ Analyst: _____

Samples IN Date: _____ Samples OUT Date: _____
Time: _____ Time: _____
Room Temp (°C) _____ Room Temp (°C) _____
Barometric pressure _____ Barometric pressure _____

	Bottle #	Sample mLs	Initial DO (mg/L)	Final DO (mg/L)	Depletion (mg/L)	Comments
Blank						Depletion must be less than 0.2 mg/L
Seeded Blank						

Seed source: _____ Seed Correction factor (SCF): _____

Sample	Bottle #	Sample mLs	Seed mLs added	Initial DO	Final DO	DO depletion	SCF	Dilution factor	BOD_5 mg/L	[1]Average BOD_5
		A		B	C	D=B-C	E	F= 300/A	F x (D-E)	
Raw										
Final										
GGA										
Replicate of_____										

[1] Average only those values which are associated with a depletion of at least 2 mg/L and a final DO ≥ 1 mg/L.

Calculation = BOD_5 mg/L = [(B-C)-E] x F

Facility Name: _____

TSS Benchsheet

Sample Location (specific)
Raw _____
Final _____
_____ _____
_____ _____
_____ _____

Sample Type (grab, xx hr Comp., etc.)
_____
_____
_____
_____
_____

Sample Date: _____
Collected by: _____

Test Date: _____
Analyst: _____

Samples IN Date: _____
Time: _____
Oven Temp (°C) _____

Samples OUT Date: _____
Time: _____
Oven Temp (°C) _____

		Influent (Raw)	Effluent (Final)	Replicate (of _____)	Other: _____	Other: _____
Crucible/filter ID						
[1]Volume Filtered (mLs)						
Crucible/Filter **AFTER** drying (g) or (mg)	1st weight					
	[2]2nd weight					
	[2]3rd weight					
Crucible/Filter tare weight (g) or (mg)	1st weight					
	[2]2nd weight					
	[2]3rd weight					
[3]Weight of dry solids (mg)						
[4]TSS (mg/L)						

[1] Filter sufficient volume of sample to capture at least 1 mg (0.001 g) of solids.

[2] If samples are dried overnight, then re-drying/re-weighing is not necessary. Otherwise, at least once each quarter, one sample must be dried/weighed, and the re-dried and re-weighed to demonstrate that a constant dry weight is achieved based on the drying time employed.

[3] Milligrams (mg) = grams x 100. The weight of dry solids must be less than 200 milligrams (0.2 g) or the analysis must be repeated using an appropriately smaller volume.

[4] TSS = $\frac{\text{weight of dry solids (mg)}}{\text{volume Filtered (mL)}} \times 1{,}000$

Facility Name: _____

Ammonia (by electrode) Benchsheet

Sample Location (specific)
Raw _____
Final _____
_____ _____
_____ _____
_____ _____

Sample Type (grab, xx hr Comp., etc.)
_____
_____
_____
_____
_____

Sample Date: _____
Collected by: _____

Test Date: _____
Analyst: _____

Calibration by: Internal (Direct Read): _____
Semi-logarithmic paper: _____
Relative millivolts: _____
Linear regression: _____

For **all** calibrations- Slope (per decade of concentration) = _____ (*must be within –54 to –60 mV*)
For linear regressions- Intercept = _____
correlation coefficient (r)= _____ (*must be ≥ 0.995*)

Concentration = Inverse/antilog of [sample mV x ***slope*** + ***intercept***]

For ALL calibrations | For linear regressions

Standard Concentration (mg/L)	Millivolts (mV)	Log_{10} of concentration[1] (mg/L)	Regression concentration[2] (mg/L)
Blank			

ALL calibrations must be based on at least 3 standards
[1] Take the log of the concentration
[2] obtained by solving for concentration using the millivolts of the standards

	Influent (Raw)	Effluent (Final)	Replicate (of _____)	Matrix Spike (of _____)
Distilled? (Y/N)				
Sample Volume mLs				
Dilution Factor (DF)				
Millivolts (mV)				
* mg/L from calibration				
** Final mg/L as NH_3				

* This is the concentration determined directly from the calibration. If there was no dilution involved (i.e., you used the same volume of sample as was used for the standards, then this is also equal to the final ammonia concentration.

** Final concentration = mg/L from calibration X DF

Dilution Factor = $\frac{\text{mLs used for standards}}{\text{mLs used for sample}}$

Facility Name: _____

Total Phosphorus Benchsheet

Sample Location (specific)
Raw _____
Final _____
_____ _____
_____ _____
_____ _____

Sample Type (grab, xx hr Comp., etc.)
_____
_____
_____
_____
_____

Sample Date: _____
Collected by: _____

Test Date: _____
Analyst: _____

Color Development in Method Blank? (Y/N): _____
Calibration by: Internal (Direct Read): _____
Graph paper: _____
Linear regression: _____

For **all** calibrations- Slope (per decade of concentration) = _____ (*monitor for consistency or significant changes*)
Intercept = _____ (*must be less than the LOD*)
For linear regressions- correlation coefficient (r)= _____ (*must be ≥ 0.995*)

Concentration mg/L = [sample absorbance X ***slope*** + ***intercept***]

For ALL calibrations For linear regressions

Standard Concentration (mg? or mg/L?)	Absorbance @ 880 nm	Regression concentration[1] (mg? or mg/L)
Blank		

ALL calibrations must be based on at least 3 standards
[1] obtained by solving for concentration using the absorbance of the standards

	Known Standard If no full calibration this day	Influent (Raw)	Effluent (Final)	Replicate (of _____)	Matrix Spike (of _____)
Sample Volume mLs					
Absorbance (*after coloring*)					
Absorbance (*before coloring*)					
Net Absorbance					
Dilution Factor (DF)					
* mg/L from calibration					
** Final mg/L as P					

* This is the concentration determined directly from the calibration. If there was no dilution involved (i.e., you used the same volume of sample as was used for the standards, then this is also equal to the final phosphorus concentration.

** Final concentration = $\frac{\text{mg}}{\text{L}}$ from calibration X DF

Dilution Factor = $\frac{\text{mLs digested for standards}}{\text{mLs digested for sample}}$ X $\frac{\text{mLs colored for standards}}{\text{mLs colored for sample}}$

Facility Name: _____

Residual Chlorine Benchsheet

Sample Location (specific)_____
Sample Type: GRAB
Sample Date/Time: _____ Test Date: _____
Collected by: _____ Analyst: _____

Calibration by: Internal (Direct Read): _____
Semi-logarithmic paper: _____
Relative millivolts: _____
Linear regression: _____

For **all** calibrations- Slope (per decade of concentration) = _____ (*must be within –54 to –60 mV*)
For linear regressions- Intercept = _____
correlation coefficient (r)= _____ (*must be ≥ 0.995*)

Concentration = Inverse/antilog of [sample mV x ***slope*** + ***intercept***]

For ALL calibrations — For linear regressions

Standard Cl_2 Equivalent (mg/L)	Absorbance @ 515 nm colorimetric test	Millivolts (mV) electrode method	Log_{10} of concentration[1] (mg/L)	Regression concentration[2] (mg/L)
Blank				

ALL calibrations should be based on at least 3 standards
[1] Take the log of the concentration
[2] obtained by solving for concentration using the millivolts/absorbance of the standards

	Effluent (Final)	Other:_____
Absorbance		
Millivolts (mV)		
Dilution Factor (DF)		
* mg/L from calibration		
** Final mg/L as Cl_2		

* This is the concentration determined directly from the calibration. If there was no dilution involved (i.e., you used the same volume of sample as was used for the standards, then this is also equal to the final ammonia concentration.

** Final concentration = mg/L from calibration X DF

Dilution Factor = $\frac{\text{mLs used for standards}}{\text{mLs used for sample}}$

Facility Name: _____

Fecal Coliform Benchsheet

Sample Location (specific)_____
Sample Type: GRAB
Sample Date/Time: _____ Test Date: _____
Collected by: _____ Analyst: _____

Samples IN Date: _____ Samples OUT Date: _____
Time: _____ Time:_____
Oven Temp (°C) _____ Oven Temp (°C) _____

Plate #	Sample Size (mLs)	# colonies on plate	Fecal coliforms per 100 mLs	Avg. Fecal coliforms per 100 mLs

Calculation: Fecal coliforms per 100 mL= $\frac{\text{\# colonies per plate}}{\text{Sample size (mL)}} \times 100$

Lab Equipment Maintenance and Calibration Log

Month _____ Year _____

Date	Analyst Intials	Sampler Temp. (°C)	Refrig. Temp. (°C)	TSS Oven Temp °C	BOD Incubator Temp °C	Fecal Incubator Temp °C	pH Meter buffers	BOD Barometer reading	BOD Room Temp °C		
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
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27											
28											
29											
30											
31											

Monthly Balance Check weight in milligram range: Actual weight(mg):_____ Measured weight(mg) _____
Monthly Balance Check weight in gram range: Actual weight (g):_____ Measured weight (g) _____

Membrane changes:

DO probe	Ammonia probe	Other probe
_____	_____	_____
_____	_____	_____
_____	_____	_____

TSS Oven should be 103-105 °°C

BOD Incubator should be 20 ± 1 C

Sampler and Refrigerator Temperature should not exceed 4° C (and samples should not be frozen)

pH calibration should be done with either a 4 and 7 buffer or a 7 and 10 buffer, depending on sample pH range. Once calibrated, one of the two buffers should be re-checked as if it was a sample. The measured pH should be within ± 0.1 pH unit of actual pH.

Corrective Action Form

QC failures

What QC type failure is involved:

___blank ___known standard ___calibration ___matrix spike ___replicate ___blind ___other

Blank: what is the LOD? _____ What level was detected in the blank? _____

Spikes/replicates: What are the acceptance criteria? _____ Your result? _____

If a matrix spike: Is this a matrix interference? ____ How do you know that?_____

_____

Known standards/blinds: True Value: _____ Acceptance criteria? _____ Your result? _____

Other pertinent information_____

_____

Other problems (equipment malfunctions, etc.)

Symptom(s) (how did you know something was wrong?):_____

_____

_____

_____

_____

_____

Corrective Action Taken

List any activities or checks you performed to identify the source and resolve the problem.

Action/Check Performed	What did you conclude?	Initials	Date

Resolution Date: _____

Briefly document how you know this problem has been corrected. What changes have you made to prevent it from recurring?

_____

_____

_____

_____

_____

_____